# FOUR NEW SPECIES OF COLLEMBOLA

ROY W. CHAMBERLAIN
Department of Zoology and Entomology, Montana State College

In this paper is included, besides descriptions of four new species of Collembola from Montana and Oregon, a key to the Genus *Onychiurus* in North America north of Mexico. The author claims no originality for this key, other than for the newly described species inserted, since it is a compilation from previous keys by Dr. J. W. Folsom and Dr. H. B. Mills.

Two of the new species, *Achorutes thomomys* and *Isotoma spatulata*, are of special interest since they were inhabitants of micro-cavern environment, the former species in gopher burrows in Montana and the latter in the nests of termites in Oregon.

Probably of all the larger genera of Collembola, that of Onychiurus has been worked on the least and is the most incomplete in the literature. While it is believed that the key to the North American species of *Onychiurus* in this paper is complete as far as references in literature are concerned, without a doubt it represents only a very small number of the species of this genus, compared with those which are waiting to be found and described. Leaf mold samples from nearly every new locality and habitat are apt to reward the collector with species hitherto unknown, but comparatively little work has been done on this group because their taxonomic characters are minute and their study represents a painstaking and eyestraining task.

## **Achorutes thomomys** Chamberlain, n. sp.

Color white, eyes absent. Postantennal organ generally with five peripheral tubercules, though occasionally with four or six (Fig. 14). Antennae shorter than the head. Proportion of antennae to head diagonal is as 3 to 4. Olfactory hairs on the 4th antennal segment four in number, three outer and one inner; large subapical tuberculate papilla present; one large apical cup-shaped socket bearing a heavy curved seta, and an adjacent smaller, socketed tubercle bearing a straight, shorter, heavy seta (Fig. 21). Ratio of antennal segments 1 to 4, 9:12:17:18 or 10:12:16:18.

Sense organ of 3rd antennal segment (Fig. 17) with two short oblong-ovate sense processes, three plain guard setae, one serrate guard seta, and two slender fusiform rods about three times as long as the sense processes.

Unguis (Fig. 19) slightly curving, finely tuberculate, with one inner tooth situated one-fourth from the tip. Unguiculus half or slightly more than half as long as unguis (inside measurement), the basal half tuberculate, distal half narrow, acuminate. Praetarsal seta long, nearly as long as unguiculus.

Two tenent hairs, weakly knobbed, the shorter slightly longer than the unguis

and extending to about the mid-point of the unguis; the longer 1 1/3 as long as the unguis and extending approximately to the inner tooth of the unguis.

Dens broad, finely tuberculate and granular, with sparse, heavy dorsal setae, one sub-apical and extending to the tip of the mucro (Fig. 15). Mucro to dens as 1:4; dens to manubrium as 5:8. Furcula extending to about the middle of the third abdominal segment (Fig. 18). Mucro feebly curved and three times as long as its basal width. Bluntly pointed in strict lateral view (Fig. 16); in 3/4 view with a sub-apical tooth-like prominence (Fig. 15), and lateral lamella giving a canoe-shaped appearance. Anal spines (Fig. 20) two, 2/5 as long as hind unguis. Anal papillae prominent, about 2/3 as long as anal horns. Clothing consisting of short, sparse, mostly serrate setae (Fig. 22), more numerous posteriorly. Setae on head irregular; irregular on meso- and meta-thorax, with occasional erect smooth setae slightly longer than the normal body setae. Abd. I, II, III roughly with two rows of setae each; setae more irregularly arranged on Abd. IV, V, and VI. No hairs on tenaculum. Three teeth on each ramus. Total length, .8 to 1.2 mm., not including antennae.

Due to the above combination of characters, this species is radically different from any hitherto described. Probably it falls into the sub-genus *Mesachorutes* Absolon, 1900, due to the reduction in eyes, the type of postantennal organ, and presence of tenent hairs. It might be placed with nearly equal justification in Bonet's subgenus, *Typhlogastrura*, 1930, due to the lack of eyes and pigmentation. The anal horn of this new species is much too small to fit his keys and description, but this is hardly of generic significance. The postantennal organs would fit the species into either the sub-genus *Typhlogastrura* or *Mesachorutes*, since they are of similar type in these two subgenera.

*Achorutes thomomys* n. sp. differs from Bonet's genotype, *Achorutes (Typhlogastrura) mendizabali*, 1930, which it resembles somewhat, in many respects, especially important among these being the shorter anal horns, the different shape of the claws, furcula, and 3rd antennal segment organ, number of olfactory hairs on antenna 4, and body covering, and in number of lobes of the postantennal organ, *A. mendizabali* having seven while *A. thomomys* has four to six.

This species was collected in great numbers by C. A. Tryon Jr. from a nest of the pocket gopher, *Thomomys talpoides* (Richardson), in the Bridger Mountains near Bozeman, Montana, in August, 1941. The cotypes are in the collection of Dr. H. B. Mills and the author.

## Key to the Genus *Onychiurus* in North America North of Mexico

1. Anal spines absent. Tubercles of postantennal organ compound or simple...2
   Anal spines present.....4
2. Tubercles of postantennal organ simple, consisting of 11 to 15.....

.....*ambulans-inermis* forma *oregonensis* Denis, 1929
Tubercles of postantennal organ compound.....3

3. Body stout. Antennal organ with four papillae and two ovate-erect sense clubs.....*fimitarius* L., Lubb., 1767, 1868
Body slender. Antennal organ with five papillae and two subreniform oblique sense clubs.....*pseudofimitarius* Fols., 1917

4. Tubercles of postantennal organ simple.....5
Tubercles of postantennal organ compound.....15

5. Postantennal organ elongate-eliptical with about 18-20 closely set tubercles .....6
Postantennal organ with about 8-14 separated tubercles.....12

6. Pseudocelli of antennal bases 3+3.....7
Pseudocelli of antennal bases 2+2 or 4+4.....11

7. Unguiculus about half the unguis. Anal papillae greatly reduced, flat.....*parvicornis* Mills, 1934
Unguiculus more than half the unguis. Anal papillae not greatly reduced..8

8. Furcula represented by two large tubercles. Postantennal organ of forty to fifty irregularly placed tubercles.....*obesus* Mills, 1934
Furcula represented by integumentary fold or not at all.....9

9. Furcula represented by integumentary fold. Tubercles of postantennal organ at right angles to long axis of the organ. Two sense clubs on third antennal organ tuberculate.....10
Furcula not represented by integumentary fold. The two sense clubs on third antennal segment organ granular.....*encarpatus* Denis, 1931

10. Tubercles of postantennal organ not crowded together. Pseudocelli of antennal base arranged in a triangle; those of fifth abdominal segment in a straight line on each side. Unguiculus as long as the unguis.....*armatus* (Tullb.), 1869
Tubercles of postantennal organ crowded together. Pseudocelli of antennal base almost in a straight line; those of fifth abdominal segment in a triangle on each side. Unguiculus much shorter than the unguis.....*pseudarmatus* Fols., 1917

11. Pseudocelli of antennal bases 2 + 2. Postantennal organ with about twenty tubercles.....*litoreus* Fols., 1917
Pseudocelli of antennal bases 4 + 4. Postantennal organ with about thirty-three to thirty-seven tubercles.....*octopunctatus* Tullb., 1876

12. Pseudocelli of antennal bases 2 + 2, rarely 3 + 3....*subtenuis* Fols., 1917
Pseudocelli of antennal bases 1 + 1.....13

13. Anal spines contigious. Sense clubs of antennal organ subovate, oblique .....*similis* Fols., 1917
Anal spines separated.....14

14. Tubercles of postantennal organ 9 in number, with lateral indentations tapering toward the point of attachment at base, giving irregular shape to tubercles; postantennal organ partially or entirely hidden in a fold; pigment absent; dorsal pseudocelli 0, 1+1, 2+2, 1+1, 1+1, 1+1, 1+1, 2+2, 0; unguis stout, strongly curving, untoothed.....*irregularis* n. sp.
Tubercles of postantennal organ 8 to 11 in number, smoothly oval, elliptical or ovate in shape, with no lateral indentations tapering toward base;

postantennal organ not hidden; yellow body pigment usually present; dorsal pseudocelli of body segments 0, 1+1, 1+1, 1+1, 1+1, 1+1, 1+1, 2+2, 0; unguis stout, feebly curving, untoothed.....*cocklei* Fols., 1908

15. Tubercles of postantennal organ distinctly branched.....16
Tubercles of postantennal organ with hundreds of closely set papillae....17

16. Third antennal segment organ with 5 papillae, 2 granular, nearly round sense clubs, 2 sense rods, and 5 guard setae. Pseudocelli on antennal base 3 + 3.....*oreadis* Mills, 1935
Third antennal segment organ with 4 papillae, 2 capitate, coarsely tuberculate sense clubs, 2 sense rods, and 3 guard setae. Pseudocelli on antennal base 2 + 2.....*ramosus* Fols., 1917

17. Anal papillae large; pseudocelli of antennal base 2 + 2, body pseudocelli as follows: 0, 1+1, 1+1, 2+2, 2+2, 1+1, 2+2, 3+3, 0; unguis curving, stout, teeth absent, basally tuberculate. Anal spines 2, 3/4 as long as hind unguis, curved. Maximum length of cotypes, 1.7 mm.....*millsi* n. sp.
Anal papillae reduced to rings; pseudocelli of antennal base 2+2, body pseudocelli as follows: 0, 0, 0, 0, 0, 0, 2+2, 2+2, 0; unguis strongly curving, basally tuberculate, 5 or 6 toothed as follows: paired pseudonychial teeth one-third from the base of the claw, a pair of lateral teeth near the apex of claw, and one or two distal teeth on the outer margin. Anal spines 2, less than half as long as the unguis, almost straight. Maximum length, 4 mm.....*dentatus* Fols., 1902

## Onychiurus millsi Chamberlain, n. sp.

Specimen entirely white, postantennal organ elongate, with a great number of closely set papillae. (Fig. 4) Antennae to head diagonal as 5 to 9; segments in the following proportions: 29:40:41:66. Third antennal segment organ (Fig. 7) with 5 slender papillae, finely tuberculate, 5 guard setae, a pair of slender, fusiform sense rods, and two papillae sense clubs. Unguis (Fig. 2) curving, stout, teeth absent, praetarsus tuberculate. Unguiculus untoothed, weakly lamellate on the proximal third, acuminate distally and one-half as long as the unguis (inside measurement). Tenent hairs absent. The pseudocelli visible from the dorsal view (Fig. 6) are as follows: Antennal base, 2-2; back of head, 0-0; prothorax, 0-0; mesothorax, 1-1; metathorax, 1-1; Abd. I, 2-2; Abd. II, 2-2; Abd. III, 1-1; Abd. IV, 2-2; Abd. V, 3-3; Abd. VI, 0-0. In addition the mesothorax, metathorax, Abd. III, and Abd. IV have one lateral pseudocellus on each side. Anal horns 2, (Fig. 3) about 3/4 as long as hind unguis, curved, with prominent, separated papillae. Clothing of body consisting of sparse short setae with a sprinkling of longer setae, about twice the length of the short ones. The anal segment is characterized by more numerous long setae than the rest of the body (Fig. 5). The supra-anal lobe is rounded. Total length, not including antennae, 1.6 to 1.7 mm.

*Onychiurus millsi* n. sp. keys out quite close by to *Onychiurus dentatus* Folsom since the postantennal organ and third antennal segment organ of these two forms are quite similar, and both have pseudocelli of antennal bases 2-2. *O. millsi* differs from *O. dentatus*, however, by lacking teeth on the unguis and by having prominent anal papillae,

while the anal papillae of *dentatus* are reduced to rings. The body pseudocelli of the two species also differs in position and number.

This new species was described from about thirty specimens collected by R. L. Post in leaf mold, Glen Harbor, Portland, Oregon, January 28, 1940. Cotypes are in the collections of Dr. H. B. Mills and the author.

### **Onychiurus irregularis** Chamberlain, n. sp.

Body color white; eyes, furcula absent; tenent hairs absent. Postantennal organ (Fig. 9, 10) in specimens examined of nine simple tubercules, more or less parallel to the long axis of the organ, showing lateral grooves which taper toward point of attachment of the tubercules and give an irregular appearance to them. Postantennal organ partially or entirely concealed in a deep fold, but may be brought into full view by careful heating in lactic acid.

Antennae about 3/4 to 5/6 of the head diagonal, segments 1 to 4 in the proportions 9:12:14:19. 3rd antennal segment organ (Fig. 13) with 5 tuberculate papillae, 4 guard setae, a pair of sense rods, and two coarsely tuberculate sense clubs.

Dorsal pseudocelli (Fig. 11) as follows: Antennal bases, 1-1; base of head, 0-0; prothorax, 0-0; mesothorax, 1-1; metathorax, 2-2; Abd. I, 1-1; Abd. II, 1-1; Abd. III, 1-1; Abd. IV, 1-1; Abd. V, 2-2; Abd. VI, 0-0; pseudocelli of the metathorax and Abd. V in oblique pairs.

Unguis (Fig. 8) rather heavy, curved, untoothed. Unguiculus slender, .6 as long as unguis (inside measurement); basal half weakly lamellate, apical half acuminate. Tenent hairs absent. Anal horns two, (Fig. 12) a little shorter than the hind unguis, or prominent, divergent papillae. Furcula absent.

Body clothing comprised of sparse, short, simple setae, longer on the anal segment. Integumentary tubercules rather large. Total length of specimen varies from 2.0 to 2.2 mm., not including antennae.

This species resembles in many respects *Onychiurus cocklei* Folsom. The main differences are that the claw is more curved dorsally; the pseudocelli are 2-2 on the metathorax instead of 1-1; the tubercules of the postantennal organ are furrowed on the sides; the postantennal organ is partially or entirely hidden in a fold; and the yellow coloration usually possessed by *O. cocklei* is absent. Described from about 40 cotypes collected under strawberry plants at Gerrais, Oregon, February 25, 1937, by Mr. R. L. Post. Cotypes in collections of Dr. H. B. Mills and the author.

### **Isotoma spatulata** Chamberlain, n. sp.

Ground color white, with sparse, light blue, punctiform pigment on base of head and on dorsal and pleural regions of mesothorax, metathorax, and Abd. I, II, III, and IV. Pigment heavier on head and thoracic segments than on the abdominal segments. (Fig. 26) Eyes absent; postantennal organ close to base of antenna (about 1 1/2 narrow widths of postantennal organ from base of antenna);

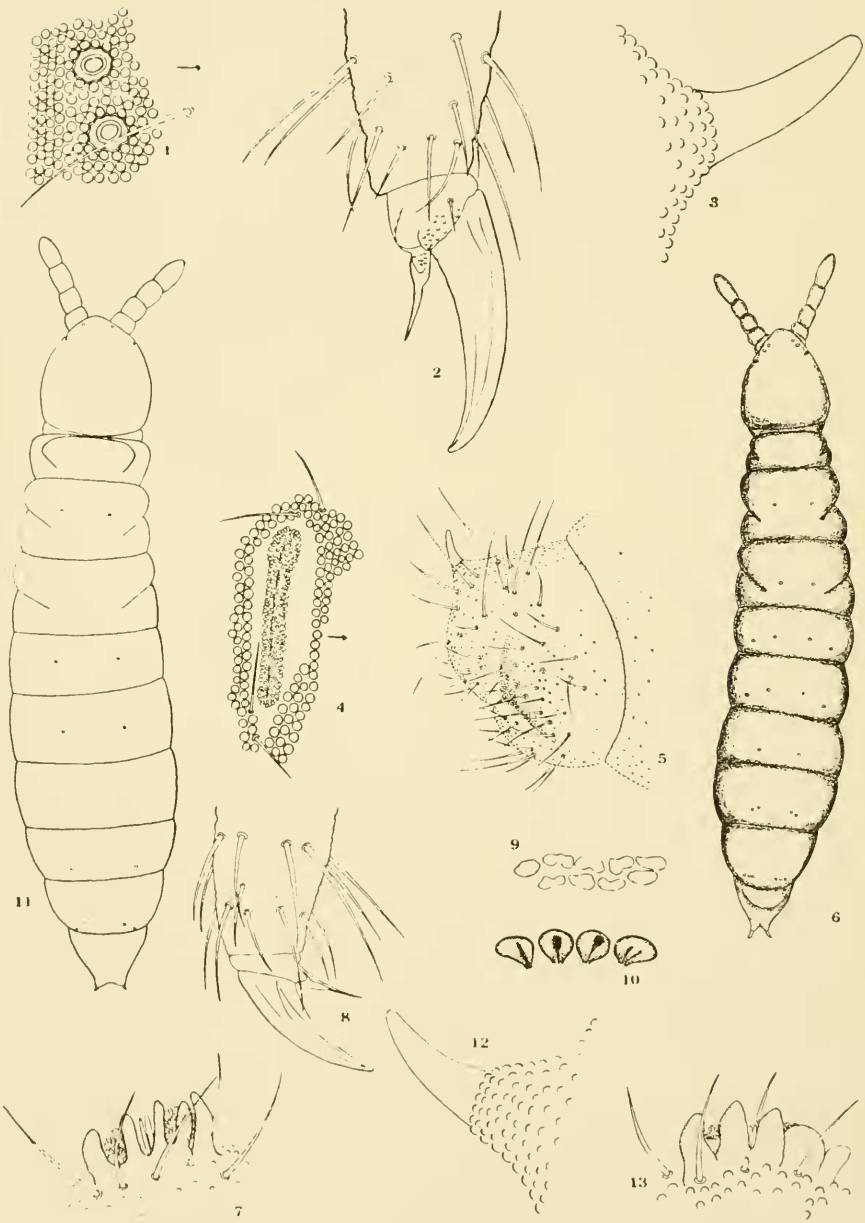


PLATE I

## EXPLANATION OF PLATES

### Plate I

*Onychiurus millsi* n. sp.

Fig. 1. Pseudocelli, 4th abdominal segment, X 487.
Fig. 2. Left hind claw, lateral view, X 487.
Fig. 3. Anal horn, X 487.
Fig. 4. Postantennal organ, X 487.
Fig. 5. Anal segment, lateral view, X 105.
Fig. 6. Entire specimen, dorsal view, X 47.
Fig. 7. 3rd antennal segment organ, X 686.

*Onychiurus irregularis* n. sp.

Fig. 8. Left hind claw, lateral view, X 334.
Fig. 9. Postantennal organ, X 686.
Fig. 10. Tubercles of postantennal organ, lateral view, X 1050.
Fig. 11. Entire specimen, dorsal view, X 43.
Fig. 12. Anal horn, X 334.
Fig. 13. 3rd antennal segment organ, X 487.

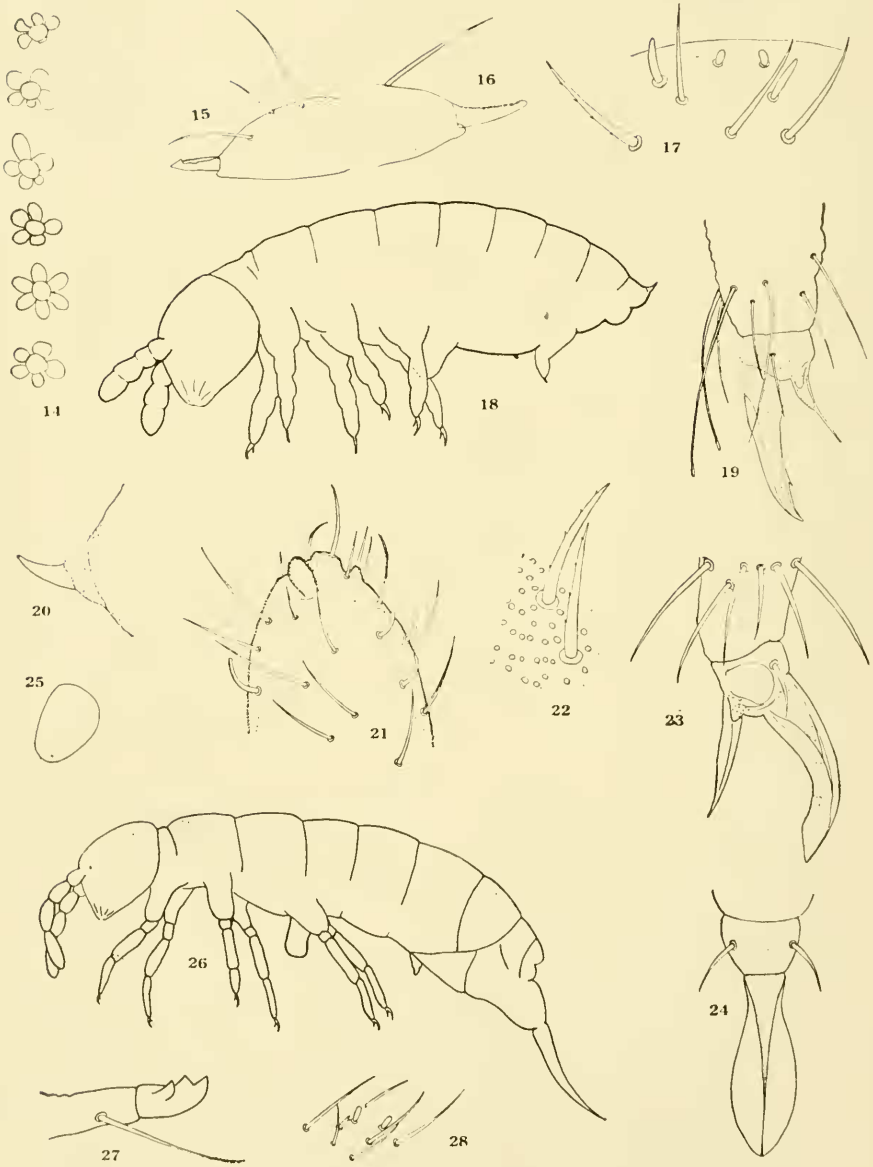


PLATE II

## EXPLANATION OF PLATES

### Plate II

*Achorutes thomomys* n. sp.

Fig. 14. Views of postantennal organ showing variations, X 945.
Fig. 15. Mucro, three-quarter view, X 652.
Fig. 16. Mucro, lateral view, X 945.
Fig. 17. 3rd antennal segment organ, X 945.
Fig. 18. Entire specimen, lateral view, X 61.
Fig. 19. Left hind claw, lateral view, X 652.
Fig. 20. Anal horn, X 652.
Fig. 21. Tip of 4th antennal segment, X 652.
Fig. 22. Serrated hairs of 4th abdominal segment, X 652.

*Isotoma spatulata* n. sp.

Fig. 23. Left hind claw, lateral view, X 675.
Fig. 24. Right mesothoracic claw, inside view, X 675.
Fig. 25. Postantennal organ, X 495.
Fig. 26. Entire specimen, lateral view, X 41.
Fig. 27. Mucro, lateral view, X 675.
Fig. 28. 3rd antennal segment organ, X 675.

irregularly egg-shaped (Fig. 25). The long axis of the postantennal organ is about 1 1/3 times as long as the mucro. Antennae slightly longer than the head diagonal, in the proportions 32:29. Relative length of antennal segments to each other, starting with first segment, 12:18:19:30. 3rd and 4th abdominal segments as 5:4. Genital and anal segments weakly separated. Unguis (Fig. 23, 24) strongly curved, sickle-shaped, without teeth, obliquely truncate apically, and with a greatly developed lateral lamella on each side which gives a spatula-shaped appearance when viewed directly from the inside; except for the lamellae, very finely tuberculate, with heavier tuberculations on the base. Unguiculus approximately 3/4 as long as the unguis (inside measurement) with no lamellae, tuberculate at base. Praetarsal seta present on each side, extending to or slightly past apex of the praetarsus. No tenent hairs present.

3rd antennal segment organ (Fig. 28) with two blunt sense processes, 2.5 to 3 times as long as wide. Furcula apparently appended to the 5th Abd., extending to the posterior portion of the 2nd Abd. segment. Dens to manubrium as 2:1, slender, tapering, finely crenulate dorsally, the crenulations ending the length of the mucro from the apex. Clothing on dens consisting of short, erect setae, with a long sub-apical seta twice the length of the mucro and extending one-third of its length past the end of the mucro. Mucro to dens as 1:28; to hind unguis as 1:2.5. Ventral margin of mucro strongly curved, with a large apical tooth, anteapical tooth approximately the same size, and a proximal tooth, lateral in position, slightly smaller (Fig. 27). Rami of tenaculum quadridentate, corpus with several anterior setae. The body of the insect is covered with plentiful, short, simple setae. Ventral tube basally with two large setae posteriorly and many anteriorly; apically with about ten setae. Total length varies from 1.5 mm. to 1.7 mm. from frons to posterior margin of anal segment.

*Isotoma spatulata* n. sp. is strongly differentiated from any described species by the following combination of characters: the absence of eyes, the presence of a postantennal organ, and the presence of broad lamellae on the unguis. Linnaniemi, 1912, describes a species from sphagnum moss in Finland which had no eyes, but a large, elliptical postantennal organ was present, and there were no teeth on the unguis. This species, *Isotoma sphagnicola* Linnaniemi, 1912, according to the literature, is one of the closest to *I. spatulata* n. sp., but it lacks the important claw character and is dissimilar in many other respects.

*Isotoma minor* Schaff. is a tiny white eyeless species, but cannot be confused with *I. spatulata* since *minor's* basic characters are so radically different as to be almost generic. In *I. minor* the postantennal organ is absent as well as the eyes, and elaborate sense organs are present on antennal segment 4.

This new species was described from 8 specimens collected in a colony of *Termopsis angusticollis* Hagen by H. W. Prescott, December 26, 1940 in Eugene, Oregon. Cotypes are in the collections of Dr. H. B. Mills and the author.